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Phenolipids as antioxidants in emulsified systems and the effect of alkyl chain length

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Lipid oxidation is a major issue in foods containing LC PUFA and a substantial effort has been made to protect lipids against oxidation. Many foods are emulsions, and according to the so called “polar paradox”¹, polar compounds work better as antioxidants in bulk oil, whereas lipophilic compounds are better antioxidants in emulsions. Recent studies carried out with phenolipids (lipophilized phenolics) have shown that increased lipophilicity didn’t necessarily lead to an increase of the antioxidative effect. When the phenolic compound reaches a certain point of lipophilicity its antioxidative effect decreases. The length of the alkyl chain for optimal antioxidant effect has been shown to be influenced by the specific phenolic compound and the type of emulsion.

The overall aim for our work was to evaluate phenolipids with different lipophilicity as antioxidants in emulsified food. In the study presented here caffeic and ferulic acid were selected along with their corresponding alkyl esters (C4-C20), which we synthesized. The methods used to evaluate the antioxidative effect of the different phenolipids were the CAT assay (o/w emulsion) combined with antioxidant assays and partitioning studies. This work strengthened the understanding of the relationship between hydrophobicity and antioxidant capacity in emulsified systems.

Keywords: Lipid oxidation, Caffeic acid, Ferulic acid, Lipophilization, Polar paradox